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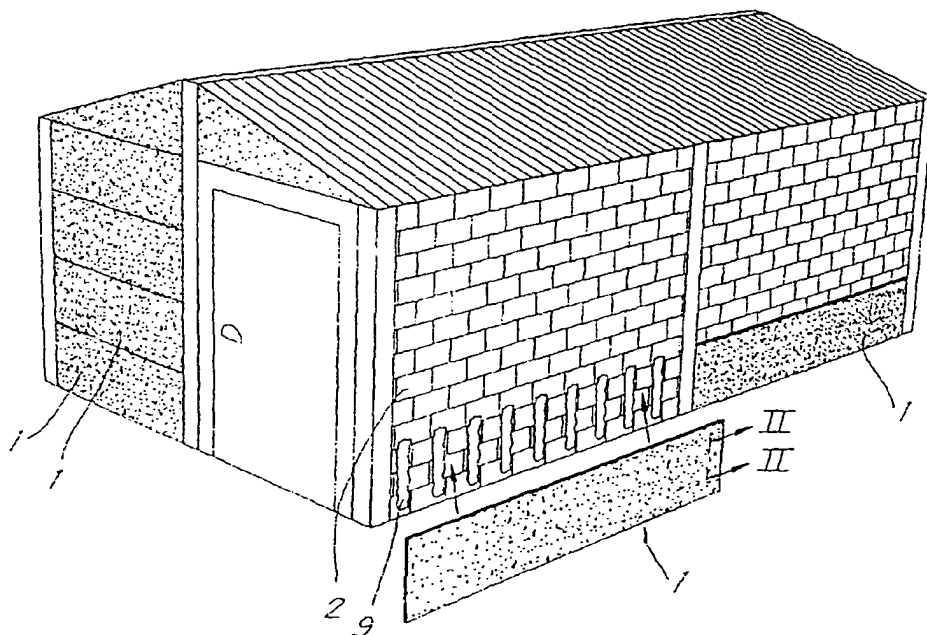
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: WALL ELEMENT, AS WELL AS COVERING FOR WALLS, WALL ELEMENTS AND THE LIKE



(57) Abstract: Wall element, in the form of a plate-shaped covering which can be provided on an existing support surface (2), characterized in that this plate-shaped covering substantially consists of a layer (3) which at least is composed of granulate-shaped particles (4) which are kept together by means of a hardened synthetic material (5) acting as a binding agent.



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Wall element, as well as covering for walls, wall elements and the like.

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5 This invention relates to a wall element, as well as a covering for walls, wall elements and the like.

More particularly, it relates to a wall element, as well as a covering of the type comprising a layer which is  
10 composed of granulate-shaped particles which are kept together by means of a hardened synthetic material acting as a binding agent.

An example of a wall element provided with such layer is  
15 described in the international patent application PCT/BE99/00154 of the present applicant. According to this international application, the aforementioned layer is attached upon a basic body consisting of a hardened substance, more particularly upon a self-supporting  
20 prefabricated element, consisting of concrete, preferably cellular concrete.

Thus, the invention described in the aforementioned international patent application is restricted exclusive-  
25 ly to embodiments where said layer is applied on a basic body consisting of a hardened substance. The present invention aims at a covering, as well as a wall element, in which also such layer is applied, however, such that new technical possibilities are offered for covering  
30 walls, obtaining wall elements, respectively.

To this aim, the invention, according to a first aspect, provides a wall element in the form of a covering plate which can be applied on an existing support surface, with  
35 as a characteristic that this covering plate substantially consists of a layer which at least is composed of

granulate-shaped particles which are kept together by means of a hardened synthetic material acting as a binding agent.

5 With the characteristic that the covering plate "substantially" consists of the aforementioned layer, it is meant that almost no or no other material than the material of this layer is present in the wall element which is realized as a covering plate. In the most  
10 preferred form of embodiment, the mass consisting of said granulate-shaped particles and the binding agent thus will extend from the front side up to the rear side of the wall element.

15 According to this first aspect of the invention, a wall element is obtained which can be made relatively thin and which easily can be attached against a previously formed support structure, in the form of a wall, facade or such, whereby this may be a support structure which is new and  
20 intended for being covered, as well as an older, existing support structure which, for example, has to be renovated.

This wall element being realized as a covering plate can  
25 be of minor as well as major dimensions and, thus, can be realized in the form of tiles as well as in the form of larger covering plates.

According to a second aspect, the invention relates to a  
30 wall element in the form of a not self-supporting composed plate, with as a characteristic that this plate is at least composed of at least one base plate and at least one covering provided thereupon which in itself consists of a layer which at least is composed of  
35 granulate-shaped particles and a quantity of synthetic material acting at least as a binding agent. By a not

self-supporting plate is meant that this plate in itself can not fulfill a carrying support function for a wall and therefore is intended for being attached against a support structure, for example, in or at a framework or  
5 against a wall.

In this manner, a wall element is obtained which in itself is easy to handle and still is relatively stable, with which walls, wall surfaces, respectively, can be  
10 formed, for example, against a grid- or frame-shaped support structure, whereby an exterior surface is created which, as aforementioned, consists of granulate-shaped particles which are kept together by means of a hardened synthetic material acting as a binding agent, which  
15 surface, as a consequence, also shows the advantages of the application of these materials.

In a preferred form of embodiment, this wall element is vapour-permeable, in other words, the base plate, the  
20 covering provided thereupon and possible other layers thereof, all are vapour-permeable.

In a practical form of embodiment, the base plate will consist of a material on the basis of wood or gypsum. In  
25 a particularly practical form of embodiment, which in the first place is suitable for forming interior walls, use shall be made of sandwich-type plaster board. According to another preferred form of embodiment, use shall be made of cement-fibre-board or gypsum-fibre-board, as a result  
30 of which a product is obtained which is very suitable for forming interior walls as well as exterior walls.

The advantage of wall elements which are realized according to the second aspect of the invention, consists  
35 in that such wall elements can easily be attached at a support surface, by means of traditional attachment

techniques which are applied for classical sandwich-type plaster boards, for example, by means of screws, nails, glue or an adhesive mortar.

5 According to a third aspect, the invention relates to a covering for walls, wall elements or such, with as a characteristic that this covering at least consists of a layer which at least is composed of granulate-shaped particles and a quantity of synthetic material acting at  
10 least as a binding agent, and that this layer, at least at the exterior side, is provided with a ground surface. Hereby, this may be coverings realized as a wall element in accordance with the aforementioned first aspect, as well as coverings which form a fixed part of a wall  
15 element, for example, are attached to a base body, as described in the international patent application PCT/BE99/00154, or are fixed on a base plate, such in accordance with the aforementioned second aspect of the invention.

20

By providing said layer with a ground surface, not only a particularly decorative surface, but also a number of technical advantages are obtained. So, for example, thereby a smooth surface is obtained, which moreover is  
25 formed by the mostly hard material of the granulate-shaped particles themselves and not by the synthetic material present around the particles, as a result of which the exterior surface will dirty less rapidly, as dirt particles, moss and such can settle down less easily  
30 on this surface.

It is noted that in the embodiments according to the aforementioned first aspect, as well as those according to the second and third aspect, the use of a layer of  
35 granulate-shaped particles and a synthetic material acting as a binding agent offers various advantages.

A first advantage consists in that always an easy to maintain surface is obtained, as this can easily be cleaned by means of water. In case that the layer is ground, it is easy to be cleaned in that the surface substantially is composed of the hard ground small surfaces which then are created at the granulate-shaped particles. In case that the layer is not ground, the surface still remains easy to be cleaned thanks to the film of synthetic material which, according to the invention, mostly is present around the granulate-shaped particles.

Another advantage consists in that the kind of the granulate-shaped particles can be chosen in function of the application. So, for example, by applying a natural kind of stone for the granulate-shaped particles, a particularly pressure-resistant and shock-resistant surface can be created.

A further advantage consists in that the mass of granulate-shaped particles and synthetic material can be coloured at random, such that surfaces with different colours can be realized. Also, different effects can be obtained by applying different granulates, in respect to colour as well as to dimension and shape, for the granulate-shaped particles.

Still another important advantage consists in that the aforementioned layer, in any case, when it is applied at the exterior side of an exterior wall, offers a good protection against weather influences, as a result of which the occurrence of moisture spots at the interior side is completely excluded.

In the embodiments according to the aforementioned first, as well as the second and third aspects of the invention, the aforementioned layer of granulate-shaped particles

and synthetic material preferably also will show one or more of the characteristics described in the following.

5 Preferably, the granulate-shaped particles together with the synthetic material form, so to speak, a single mass which, in hardened condition, manifests itself as the aforementioned layer. As a consequence, a compact structure of mutually adhered granulate-shaped particles is obtained.

10

In the most preferred form of embodiment, however, free passages through the aforementioned layer are present, such that the surface against which this layer is provided, remains in connection with the ambient air, with as an advantage that possible moisture prevailing in the material which is present behind said layer, can escape freely through said layer. Hereby, it is important that classical vapour-tension problems, which sometimes may lead to a loosening of wall coverings, as well as may cause other problems, are excluded or at least minimized.

20

Preferably, hereby passages are concerned which are obtained in that a well-defined quantity of synthetic material in relation to the granulate-shaped particles is applied, which quantity is chosen such that, after mixing the granulate-shaped particles and the synthetic material, and after hardening this latter, free passages, as aforementioned, remain present between the granulate-shaped particles.

30

Therefore, no separate treatments have to be performed for creating such passages. It is evident that the relation between the quantities of granulate-shaped particles and synthetic material can be determined by trial and error in order to maintain such passages.

35

Further, it is also preferred that the aforementioned layer shows one or more of the following features:

- 5           - that the granulate-shaped particles are formed of a natural kind of stone and that consequently a hard surface can be obtained;
- that the particles and/or the synthetic material are artificially coloured, with the advantage that a surface can be realized with the desired and/or with different colours;
- 10          - that the thickness of the layer has at least two times the thickness of the average size of the granulate-shaped particles, with the advantage that one can not directly see through the layer and therefore a good covering of the exterior
- 15           surface is obtained, even if free passages are present between the granulate-shaped particles;
- that the granulate-shaped particles have an average size of 2 to 5 mm, with the advantage that a good covering can be realized, even if
- 20           this layer is relatively thin.

With the intention of better showing the characteristics of the invention, hereafter, as an example without any limitative character, several preferred forms of

25   embodiment are described, with reference to the accompanying drawings, wherein:

figure 1 schematically represents an application of a wall element according to the first aspect of the

30   invention;

figure 2, at a strongly enlarging scale, represents a cross-section according to line II-II in figure 1;

figure 3 represents a wall element according to the second aspect of the invention;

35   figure 4, at a strongly enlarging scale, represents a cross-section according to line IV-IV in figure 3;



figures 5 to 7 further represent a number of variants of the embodiment of figure 2.

5 In figures 1 and 2, wall elements 1 are represented which are realized according to the aforementioned first aspect of the invention. Hereby, wall elements 1 in the form of a plate-shaped covering are concerned, which can be provided on an existing support surface 2.

10 The particularity hereby consists in that the wall element 1 is realized as a plate-shaped covering which substantially consists of a layer 3 which is at least composed of granulate-shaped particles 4 which are kept together by means of a hardened synthetic material 5  
15 acting as a binding agent. As represented, apart from this layer 3 preferably no other structural layers of material are present in the wall element 1, such that the stability thereof, as well as other characteristics, such as the vapour-permeability, are determined exclusively by  
20 the material of the layer 3, being the granulate-shaped particles 4 and the synthetic material 5. Thus, this means that the mass consisting of said granulate-shaped particles 4 and the binding agent 5 extends from the front side 6 up to the rear side 7 of the wall element 1.

25 Although the wall element 1 thus preferably exclusively is formed of the granulate-shaped particles 4 and the binding agent 5, it is, however, not excluded to include additional elements in or at the layer 3, such as, for  
30 example, a reinforcement net or such.

As it is intended to commercialize the wall element 1 as such, the layer 3, or, thus, the wall element 1, preferably is realized with a thickness which offers  
35 sufficient stability for performing the transport of such plates without these plates breaking easily. Practically,

it is preferred that such wall element 1 thus has a thickness D1 of minimum 1 cm, although smaller thicknesses are not excluded. It is obvious that, with large dimensions of the wall elements 1, preferably at least the aforementioned thickness of 1 cm is applied, 5 whereas with wall elements 1 in the shape of smaller tiles, this thickness will be considerably smaller, if desired.

10 Analogous as explained in the international patent application PCT/BE99/00154, the granulate-shaped particles 4 can be of any kind, in respect to the material from which they are manufactured, as well as in respect to the manner in which they are obtained. The basic material 15 from which these granulate-shaped particles 4 are formed, may, for example, consist of a natural kind of stone, such as marble, gravel or blue-stone, however, may as well consist of another kind of material, such as granulated synthetic material or glass, or still of a 20 mixture of different materials. Moreover, one may start from a material which is granulated in itself, as well as of materials which are granulated to form said particles 4, for example, by being broken and/or ground or by being composed starting from a pulverized basic substance.

25 As mentioned in the foregoing, the synthetic material 5 preferably is a synthetic material based on polyurethane, epoxy or such, however, it is evident that other synthetic materials are not excluded, on the condition 30 that they guarantee a sufficiently large adhesion and, if desired, also sufficient sealing.

Preferably, the layer 3 is obtained from a mixture of granulate-shaped particles 4 with the synthetic material 35 5. As a result thereof, it is guaranteed that a film of synthetic material is always present around the particles

4, as a consequence of which a good adhesion at each contact point between two particles 4 is guaranteed. By using a transparent synthetic material 5, the tint or colour of the particles 4 remains visible. By using a coloured synthetic material 5, however, particular colour effects can be created. It is also possible to treat the granulate-shaped particles 4 with a colour, for example, pigment.

10 In the form of embodiment of figure 2, the wall element 1, and more particularly the layer 3, shows free passages 8 between the rear side 7 and the front side 6, as a result of which, as explained in the introduction, moisture, more particularly vapour, may escape through  
15 the wall element 1 towards the exterior.

The wall element 1 can be manufactured by mixing a mass of granulate-shaped particles 4 with synthetic material 5 still to be hardened, and to spread this mass with a thickness D1 on a non-adhesive, for example, horizontal, support surface, and subsequently letting the obtained layer 3 harden, after which said layer can be removed from the support surface in the shape of a plate. The mass can be spread such that a wall element 1 is obtained  
20 which immediately has the desired dimensions, however, of course a wall element 1 with well-defined dimensions can be formed of the hardened layer 3 by cutting said wall element out of the layer 3, for example, by means of sawing or cutting by grinding.

30 The wall element 1 can be applied and provided on a support surface 2 in different manners. Preferably, however, one will proceed such as schematically represented in figure 1. Hereby, an adhesive agent 9, such as glue, cement or the like, is provided on the support  
35 surface and/or on the rear side 7 of the wall element 1,

and subsequently the wall element 1 is fixed at the support surface 2 by means of the adhesive agent 9.

5 By using a wall element 1 which, as mentioned in the foregoing, is provided with passages 8, the advantage is created that, when the support surface 2 consists of a vapour-permeable structure, the whole still remains vapour-permeable.

10 Of course, the vapour-permeable support surface 2 can be of different kind, however, stone or concrete walls and in particular walls formed of blocks of cellular concrete are particularly suitable for this purpose.

15 Of course, one must take care that, when one wants to maintain a vapour-permeable whole, the adhesive agent 9 does not form a vapour barrier. This is, amongst others, possible by providing either the adhesive agent 9, when this latter is not vapour-permeable, locally on the  
20 support surface 2, such as illustrated in figure 1, or by applying a vapour-permeable adhesive agent 9.

Figures 3 and 4 represent a wall element 10 which is realized according to the second aspect of the invention.  
25 Hereby, a wall element 10 in the form of a not self-supporting composed plate is concerned, with as a characteristic that this plate, as is clearly visible in the enlarged representation of figure 4, at least is composed of at least one base plate 11 and at least one  
30 covering provided thereupon which in itself consists of a layer 12 which, in respect to the composition thereof, is identical with and/or comparable to said layer 3, and therefore at least is composed of granulate-shaped particles 4 and a quantity of synthetic material 5 acting  
35 as a binding agent.

Depending on the desired effect, the wall element 10 either can be realized vapour-permeable or not.

5 As explained in the introduction, the base plate 11 can be of a different kind. In the represented example, it consists of sandwich-type plaster board, which traditionally is constructed of a core 15 of gypsum enclosed between two layers of cardboard 13-14.

10 The base plate 11 has, for example, a thickness D2 of approximately 1 cm, whereas the layer 12 has a thickness D3 of, for example, 2 to 5 mm. Of course, other values for the thicknesses D1, D2 and D3 are not excluded.

15 The layer 12 can be provided at the base plate 11 in different ways. So, for example, it may first be formed in a manner analogous to the forming of the layer 3, however, possibly thinner than this latter, after which it is attached against the base plate 11, for example, by  
20 means of an adhesive layer 16, such as glue.

According to another possibility, the layer 12 can be formed by spreading the mass of granulate-shaped particles 4 and synthetic material 5 on the base plate 11  
25 before the synthetic material 5 has hardened, such that by the hardening of the synthetic material 5, not only an adhesion between the particles 4 is obtained, but also an adhesion of the layer 12 on the base plate 11.

30 Besides, all characteristics described in respect to the layer 3 also apply for layer 12.

Figure 5 illustrates the third aspect of the invention, discussed in the introduction, in this case applied to a  
35 wall element 1, more particularly a layer 3, such as described in the foregoing. The particularity hereby

consists in that the layer 3, at the exterior side or, thus, front side 6, is provided with a ground surface, in other words, this surface is ground off through the granulate-shaped particles 4 concerned, which offers the advantages mentioned in the introduction.

Of course, this third aspect of the invention can also be applied to a layer 12 which is attached on a base plate 11, and further also to layers consisting of granulate-shaped particles 4 and synthetic material 5 which are provided on other elements, for example, on basic bodies of a hardened substance, such as described in the international patent application PCT/BE99/00154.

Figure 6 represents another particular form of embodiment, whereby the synthetic material 5 is mixed with an inert filling agent, for example, stone ground to powder or very fine particles, whereby particular effects can be created.

Figure 7 corresponds to figure 6, with the only difference that the front side 6, in accordance with the third aspect of the invention, is ground off. As the synthetic material 5 is mixed with filling agent, ground surfaces 17 at granulate-shaped particles 4, as well as ground surfaces 18 at the filling mass are obtained, which both create the appearance of stone.

It is clear that here, too, the quantity of synthetic material 5 with filling agent present therein can be chosen such that passages 8 for vapour and the like are maintained. If, however, one wants to obtain the largest possible passages 8, preferably no filling agent will be provided in the synthetic material 5.

Of course, the use of filling agent in combination with

the synthetic material 5 can also be applied in a layer 12 which is provided on a base plate 11.

5 It is noted that, according to not-represented variants, the quantity of synthetic material 5 also can be chosen such that a closed structure, thus, without passages 8, is obtained, whereby the vapour-permeability then, however, is affected in a disadvantageous manner, which, however, does not pose a problem for certain  
10 applications.

The aforementioned passages 8 also can be realized in other ways, for example, by drilling holes into the layer 3 or 12, or, when forming this layer 3 or 12, providing  
15 pins therein which are removed after hardening.

The present invention is in no way limited to the forms of embodiment described by way of example and represented in the figures, however, such wall element, as well as  
20 such covering, can be realized according to different variants, without leaving the scope of the invention.

Claims.  

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1.- Wall element, in the form of a plate-shaped covering  
5 which can be provided upon an existing support surface  
(2), characterized in that this plate-shaped covering  
substantially consists of a layer (3) which at least is  
composed of granulate-shaped particles (4) which are kept  
together by means of a hardened synthetic material (5)  
10 acting as a binding agent.

2.- Wall element according to claim 1, characterized in  
that the mass consisting of said granulate-shaped  
particles (4) and the binding agent extends from the  
15 front side (6) up to the rear side (7) of the wall  
element (1).

3.- Wall element according to claim 1 or 2, characterized  
in that the wall element (1) is formed exclusively from  
20 said layer (3), formed by the granulate-shaped particles  
(4), and the binding agent.

4.- Wall element according to any of the preceding  
claims, characterized in that said layer (3), at its  
25 exterior side, more particularly the front side (6), is  
provided with a ground surface.

5.- Wall element, in the form of a not self-supporting  
composed plate, characterized in that this plate at least  
30 is composed of at least one base plate (11) and at least  
one covering provided thereupon which itself consists of  
a layer (12) which at least is composed of granulate-  
shaped particles (4) and a quantity of synthetic material  
(5) acting at least as a binding agent.

35

6.- Wall element according to claim 5, characterized in



that this wall element (10) and, thus, the base plate (11), the covering provided thereupon and possible other layers thereof, are vapour-permeable.

5 7.- Wall element according to claim 5 or 6, characterized in that it comprises a base plate (11) of a material on the basis of wood or gypsum.

10 8.- Wall element according to claim 7, characterized in that it comprises a base plate (11) formed by a sandwich-type plaster board, gypsum-fibre-board or cement-fibre-board.

15 9.- Wall element according to any of the claims 5 to 8, characterized in that said layer (12), at its exterior side, more particularly, front side (6), is provided with a ground surface.

20 10.- Wall element according to any of the preceding claims, characterized in that the granulate-shaped particles (4) and the synthetic material (5) of said layer (3-12) form a mixed hardened mass.

25 11.- Wall element according to any of the preceding claims, characterized in that the synthetic material (5) consists of a synthetic material (5) on the basis of polyurethane, epoxy or the like.

30 12.- Wall element according to any of the preceding claims, characterized in that there are free passages (8) through said layer (3-12).

35 13.- Wall element according to any of the preceding claims, characterized in that substantially, said synthetic material (5) only forms a film around the granulate-shaped particles (4) and thus mutually binds

these, whereby the quantity of synthetic material (5) is chosen such that free passages (8), as aforementioned, remain between the granulate-shaped particles (4).

5 14.- Wall element according to any of the preceding claims, characterized in that said layer (3-12) shows one or more of the following features:

- that the granulate-shaped particles (4) are formed of a natural kind of stone;
- 10 - that the particles (4) and/or the synthetic material (5) are artificially coloured;
- that the thickness (D1-D3) of the layer (3-12) has at least two times the thickness of the average size of the granulate-shaped particles
- 15 (4);
- that the granulate-shaped particles (4) have an average size of 2 to 5 mm;
- that in the layer (3-12), a filling agent on the basis of stone or the like is included.

20

15.- Covering for walls, wall elements or the like, characterized in that this covering at least consists of a layer (3-12) which at least is composed of granulate-shaped particles (4) and a quantity of synthetic material

25 (5) acting at least as a binding agent, and that this layer (3-12) at the exterior side, more particularly the front side (6), is provided with a ground surface.

16.- Covering according to claim 15, characterized in

30 that the layer (3-12) in itself shows one or more characteristics, as defined in any of the claims 10 to 14. Wall element, as well as covering for walls, wall elements and the like.

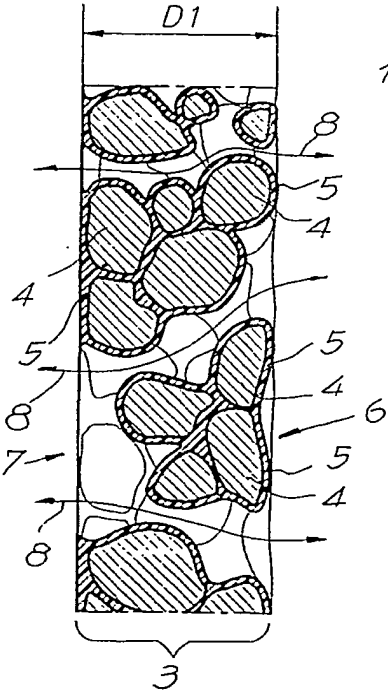
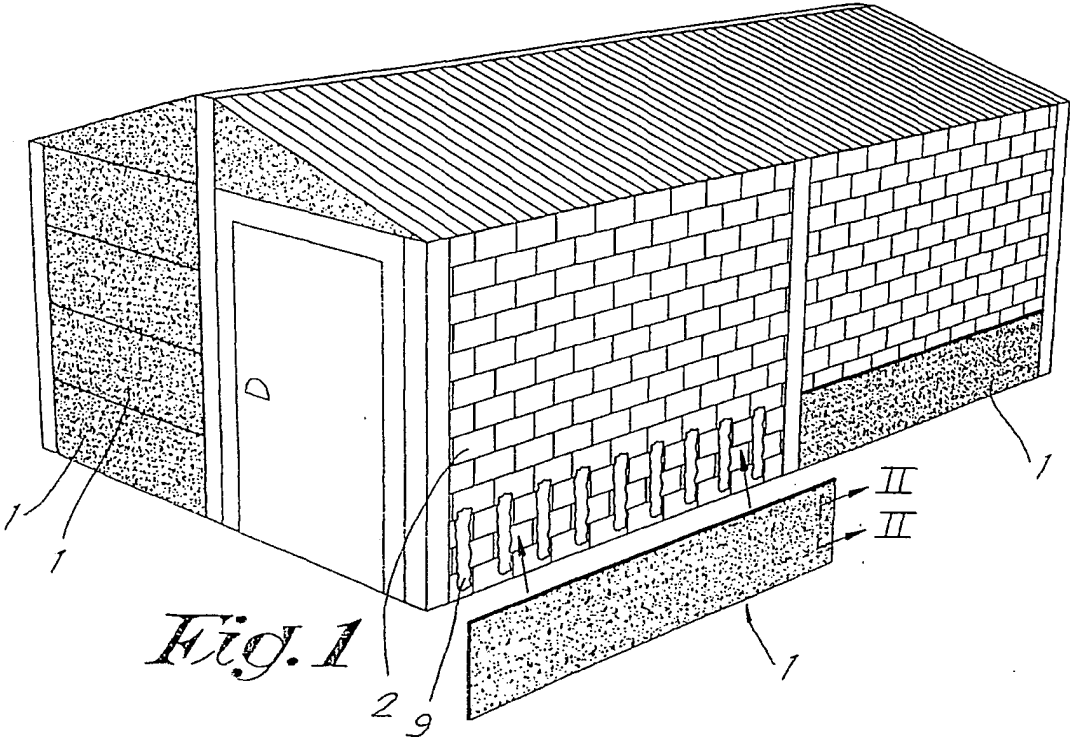


Fig. 2

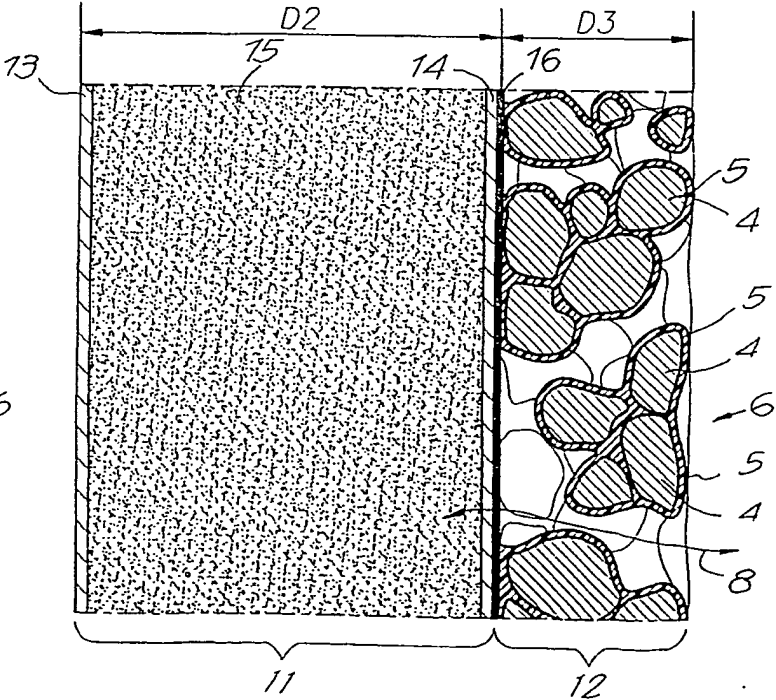
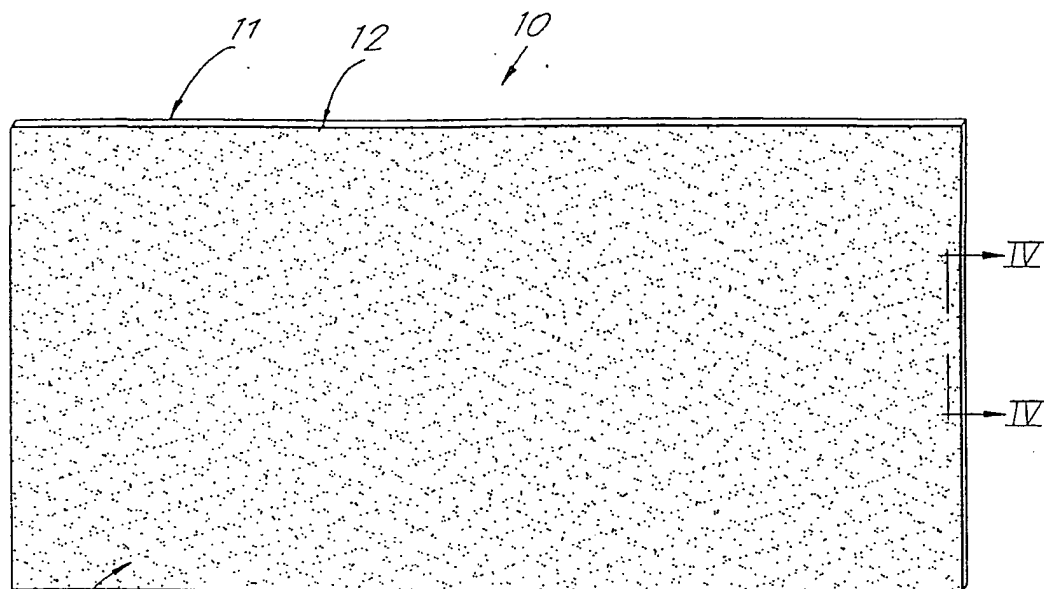
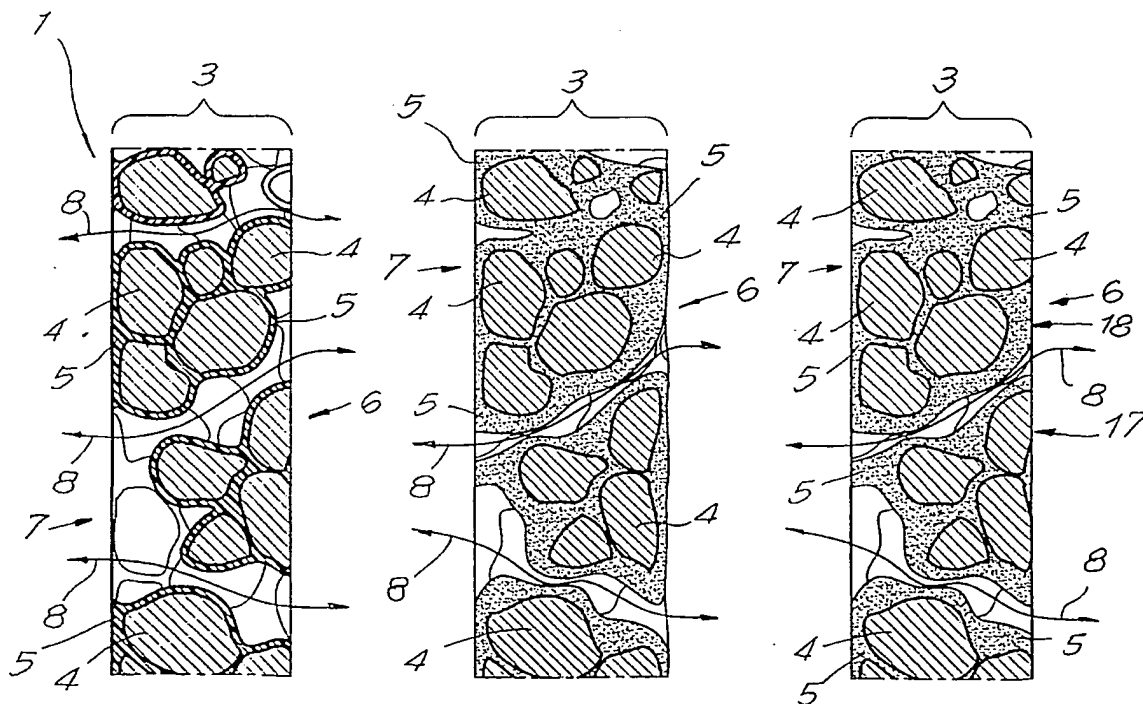


Fig. 4

2/2



*Fig. 3*



*Fig. 5*

*Fig. 6*

*Fig. 7*

## INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/BE 01/00095

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C04B26/06 E04F13/14 E04C2/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C04B E04F E04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 38 37 430 A (KONTRINER) 10 May 1990 (1990-05-10)	1-3
Y	the whole document	4, 15
Y	--- PATENT ABSTRACTS OF JAPAN vol. 015, no. 182 (M-1111), 10 May 1991 (1991-05-10) & JP 03 043561 A (TAKIRON CO LTD), 25 February 1991 (1991-02-25)	4, 15
A	abstract	9
Y	--- DE 39 09 169 A (TAKAHASHI ET AL.) 5 October 1989 (1989-10-05)	5, 6, 10-13
A	column 3, line 25 -column 4, line 60; figures 1, 2	16
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Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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# INTERNATIONAL SEARCH REPORT

Int. Patent Application No.

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